

Sector-Based Workshop

Business and Industry

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Overview

Categories Within Business and Industry Sector

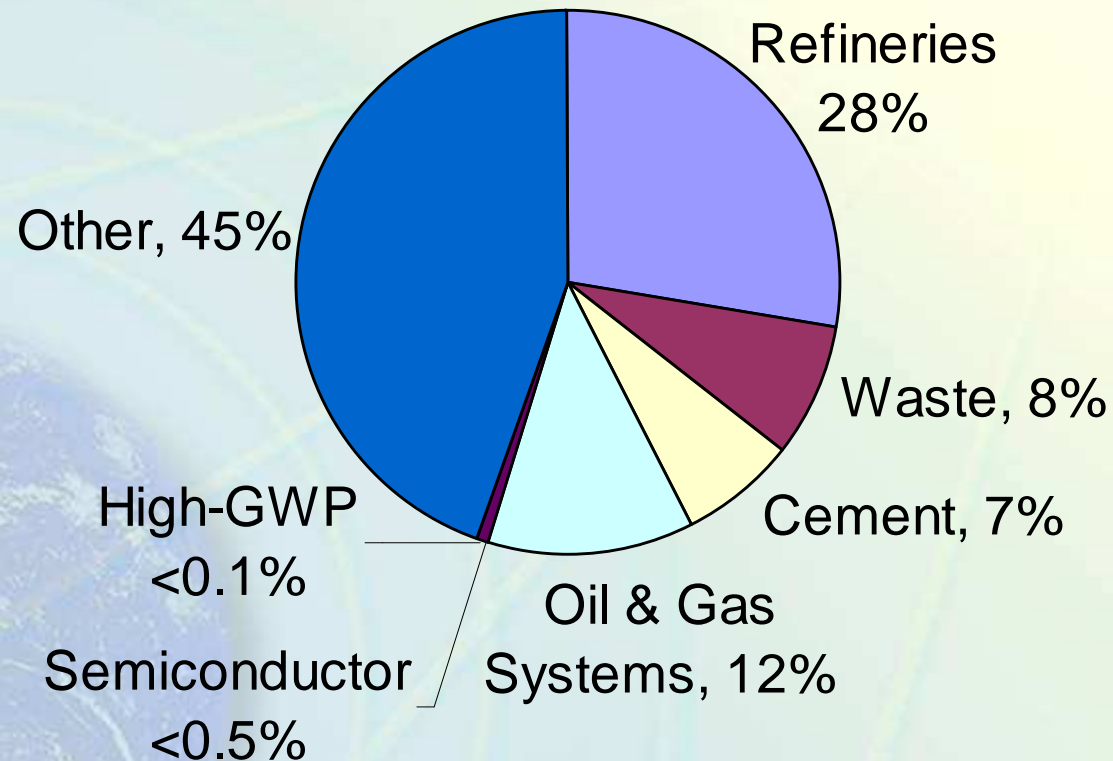
- Cement
- Oil and Gas Systems
- Refineries
- Waste
- Semiconductor Industry
- High-GWP
- Other

Overview

- Emissions Within Sector
- Sector Profile
- Current Regulatory Status
- Potential Reduction Strategies

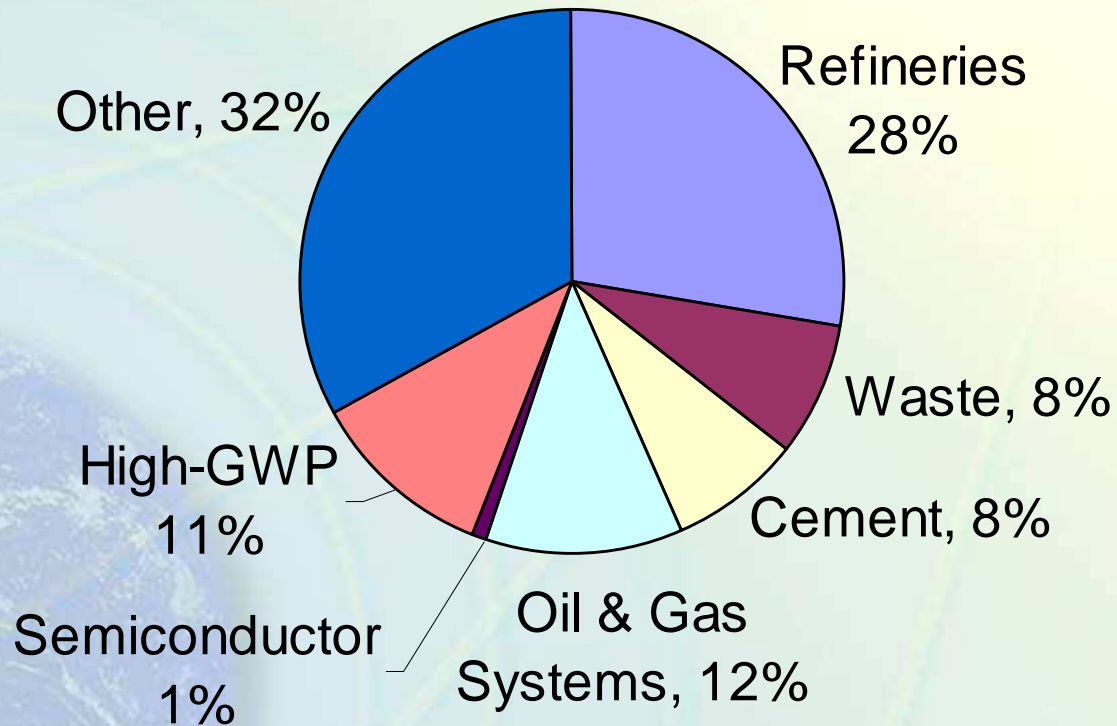
Business and Industry Emissions

1990 Inventory by Subsector [119 MMTCO₂E total]



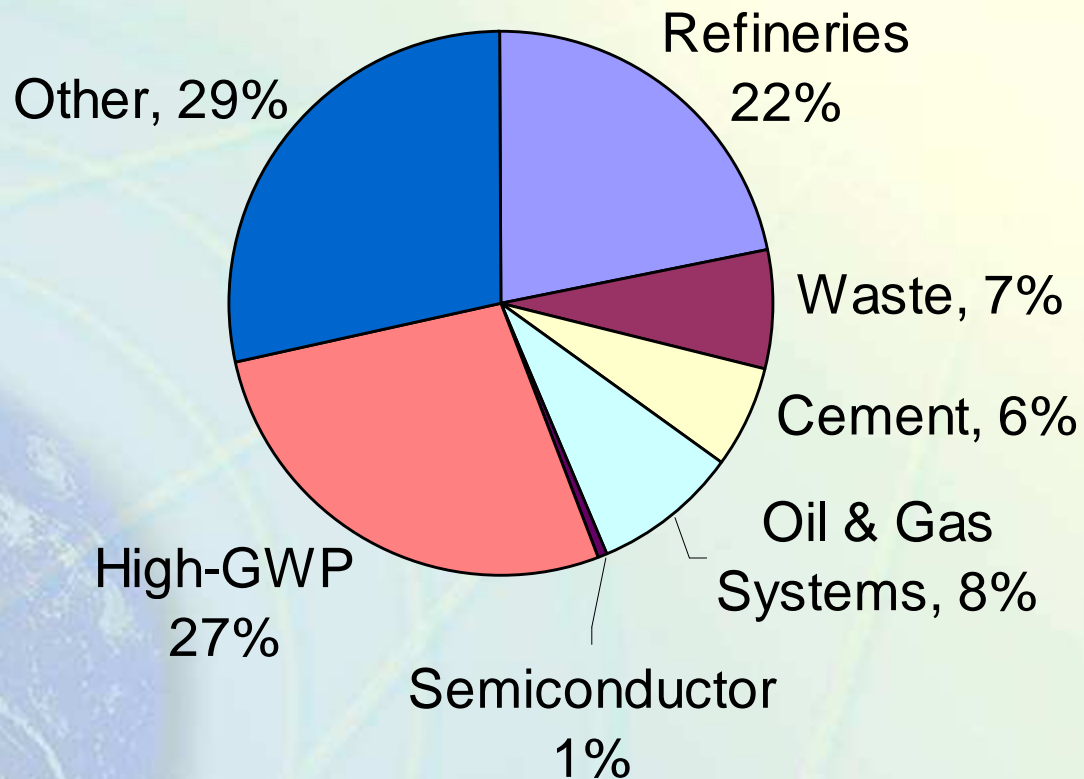
Business and Industry Emissions

2004 Inventory by Subsector [125 MMTCO₂E total]



Business and Industry Emissions

2020 Projections by Subsector [165 MMTCO₂E total]



Overall Sector Profile

- **Cement**
 - 11 facilities
 - Employs approximately 2,300 people
 - Various locations in CA
- **Oil and Gas Systems**
 - 50,000 oil and 1,000 gas wells
 - Employs approximately 7,000 people
 - Mostly located in Central Valley and Southern California, including off-shore drillings

Overall Sector Profile

- Refineries
 - 21 facilities
 - Employs over 17,000 people
 - Located mostly in SF Bay Area and LA Area
- Waste (Landfills, Waste Water, and Composting)
 - 367 Municipal Solid Waste landfills
 - Approximately 300 composting facilities statewide
 - Employs approximately 40,000 people
 - Operating in most counties
 - Generated 85 million tons / Land-filled 42 million tons/ Diverted 43 million tons (2005)

Overall Sector Profile

- Semiconductor Industry
 - Numerous facilities
 - Located throughout CA
 - Employs approximately 9,000 people

Existing Controls

- **Cement**
 - No explicit controls for greenhouse gases
 - Baghouses and electrostatic precipitators to control particulate matter emissions
 - Cogeneration unit at one facility regulated by a district regulation
 - ARB staff coordinating development of Early Action Measures and Scoping Plan Measures
- **Oil and Gas Systems**
 - District rules reduce criteria pollutants and methane emissions

Existing Controls

- Refineries
 - Air district rules reduce criteria pollutants, methane emissions reduced as a co-benefit
 - Fugitive emission rules
 - Storage tank rules
 - Cogeneration unit at facilities regulated by district permits
 - Increased energy efficiency--co-benefit of regulatory requirements

Existing Controls

- Waste
 - Methane emission controls for safety and water quality (CCR Title 27)
 - Landfills
 - Federal New Source Performance Standards/Emission Guidelines and National Emission Standards for Hazardous Air Pollutants
 - Local Air District Rules
 - Composting
 - Composting in SCAQMD and SJV requires enclosures or other mitigation measures for VOC and PM

Existing Controls

- Semiconductor Industry
 - South Coast, Antelope Valley, Bay Area, Placer and Ventura County Districts limit VOCs
 - National Emission Standards for Hazardous Air Pollutants
 - Memorandum of Understanding between U.S. EPA and over 20 national companies
 - Reduce PFC emissions to 10% below 1995 level by 2010

Potential Controls: Early Action Concepts

- Cement
 - Blended Cements: Limestone and supplementary cementitious materials (SCMs)—to be developed in collaboration with CalTrans and other affected parties
 - Blending with limestone
 - Blending with SCMs – fly ash, slag, and pozzolan
 - Alternative fuels and improved energy efficiency
 - Require preheater/precalciner heat recovery system
 - Raw material preparation
 - Clinker production
 - Emission reduction potentials and cost impacts - to be determined

Potential Controls: Early Action Concepts

- Oil and Gas Systems
 - Reduce fugitive methane emissions
 - Install cost-effective technologies
 - Improve management practices
 - Emission reduction potential of 1.0 MMTCO₂E
 - Scheduled for adoption in 2010
- Refineries
 - No Early Actions

Potential Controls: Early Action Concepts

- Waste
 - Landfill Methane Capture (Discrete Early Action Measure)
 - Original proposal from CIWMB – would require adoption by ARB
 - Requires controls at uncontrolled landfills
 - Surface monitoring standards
 - Gas collection and control system standards
 - Monitoring, recordkeeping, and reporting requirements
 - Composting (Early Action Measure)
 - Requirements for enclosures and other mitigation measures may increase GHG emissions
 - VOC/PM mitigation measures may limit ability to process greenwaste

Potential Controls: Early Action Concepts

- Semiconductor Industry
 - Reduce PFC emissions
 - Emissions reduction potential of 0.5 MMTCO₂E
 - Scheduled for adoption in 2008

Potential Emission Reduction Measures

- Cement
 - Analysis of control strategies beyond those for Early Action measures pending
- Oil and Gas Systems
 - CO₂ reductions associated with combustion activities
 - Consider energy efficiency measures
 - Evaluate potential for recycling of waste gases

Potential Emission Reduction Measures

- Refineries
 - “Bottom-up” approach: Refinery specific evaluation
 - Permit reviewing (Cooperating w/ the Districts, CEC, and U.S. EPA)
 - Working to identify the major emission sources
 - Evaluating fuel production and consumption, electricity and steam usage
 - Evaluating process efficiencies within each facility
 - “Top-down” approach: Reviewing refinery modeling for GHG
 - Evaluating modeling work being performed by the oil industry

Potential Emission Reduction Measures

- Waste
 - Composting
 - Net reduction in GHG emissions if greenwaste is composted and applied as a soil amendment vs. landfill
 - Commercial recycling programs
 - Requires commercial sector to increase collection of recyclable materials
 - Waste technology demonstration, assessment, and development
 - Demonstrate viability of commercial scale waste technologies currently used in Europe (including waste conversion and biogas-to-fuel technologies)
 - Expand awareness of AB 1969
 - AB 1969 requires purchase specified amounts of renewable energy
 - CPUC/CIWMB funding to expand awareness to qualifying landfill gas facilities

Potential Emission Reduction Measures

- Semiconductor Industry
 - Process Optimization
 - Reduces the amount of PFCs used
 - Alternative Chemistries
 - Substitute gases for hexafluoroethane (C_2F_6) in the chamber cleaning process
 - Emissions Abatement
 - Commercially available technologies
 - Performance of abatement systems varies
 - Recovery/Recycling
 - More costly or require more maintenance than other measures
 - Recovered compounds contain more impurities than virgin chemicals

Summary

- Maximum feasible and cost effective technologies to be analyzed
- Strategy dependent upon industry
 - Increases in energy efficiency
 - Process modification
 - Product reformulation
 - New technologies
- These industries will also be evaluated for possible inclusion in a cap and trade system
- Some industries could become sources for offsets

High-Global Warming Potential Sources

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Overview

- What Are High-Global Warming Potential (GWP) Greenhouse Gases (GHGs)?
 - HFCs, PFCs, SF₆
 - Kyoto Protocol Gases
 - Emissions Control Varies by Country, Market System (Clean Development Mechanism, Voluntary Carbon Market)
 - Class I and II Ozone Depleting Substances (ODSs): CFCs, HCFCs, Halons, *et al.*
 - Montreal Protocol Gases
 - New Production, Imports, Exports Controlled; Emissions Not Controlled
 - Other High-GWP GHGs
 - NF₃, HFEs, PFPEs
 - Controlled Neither by Montreal Nor Kyoto Protocols

Overview

- How are High-GWP GHGs Accounted for under AB 32?
 - Kyoto Gases are Directly Included in 1990 Baseline and 2020 Target
 - Several non-Kyoto gases with climate impact are not in baseline but are being evaluated for mitigation

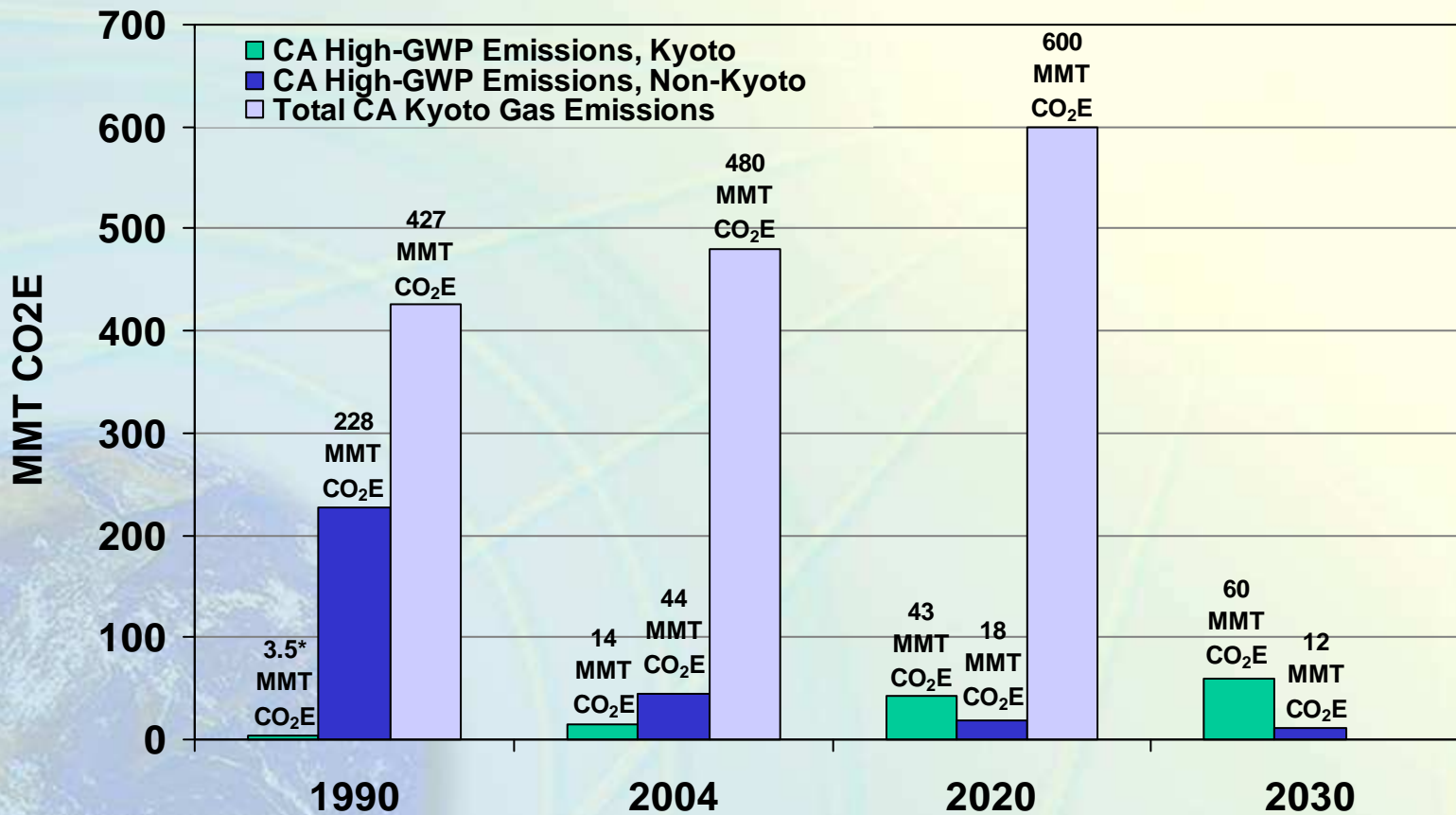
Overview

- High-GWP GHG “Sector” End-Use Categories
 - Mobile Sources
 - Motor Vehicle Air Conditioning (MVAC) Systems
 - Stationary Sources
 - Refrigeration and Air Conditioning (RAC), Foams, Fire Extinguishing, Solvent Cleaning, Industrial Applications, Electrical Transmission
 - Consumer Products
 - Propellants

California Emission Inventory (EI) Approaches

- USEPA Vintaging Model (VM) Estimates
 - VM Between IPCC Tier 2 and Tier 3 Inventory Development Approaches; VM is a Bottom-Up Model, but is Also Compared with Top Down Data
 - National Estimates Distributed from US to CA Based on Population Fraction
- Verification Based on Ambient Monitoring
 - Mt. Wilson Study, NOAA, MLD Network, Walnut Grove Study, AGAGE Network, Mobile Monitoring
- California-Specific Inventory Development
 - Numerous Inventory Studies and Surveys Underway for Stationary, Mobile, and Consumer Product High-GWP GHG Sources
- SCAQMD Rule 1415: ODS Leak Rate Data
 - Leak Rates for Large, Stationary RAC Systems Available from SCAQMD Rule 1415 Data

CA High-GWP GHG Emissions

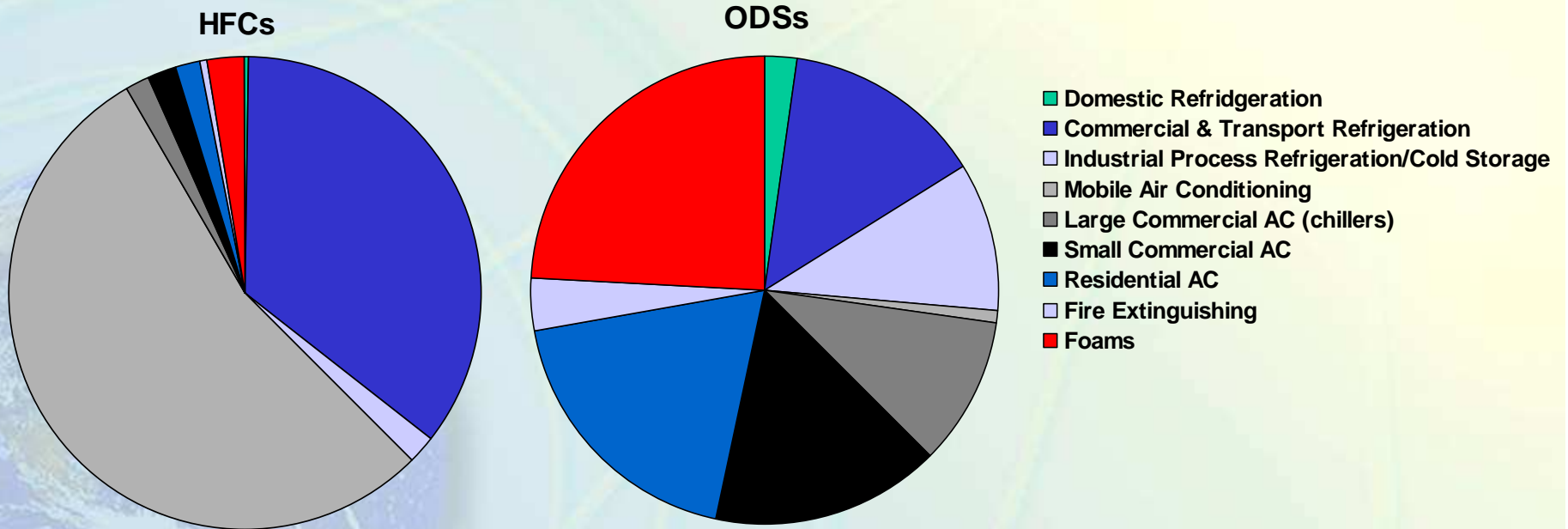


*Note: 3.5 MMT CO₂E in 1990 represents all Kyoto gases, mostly SF₆

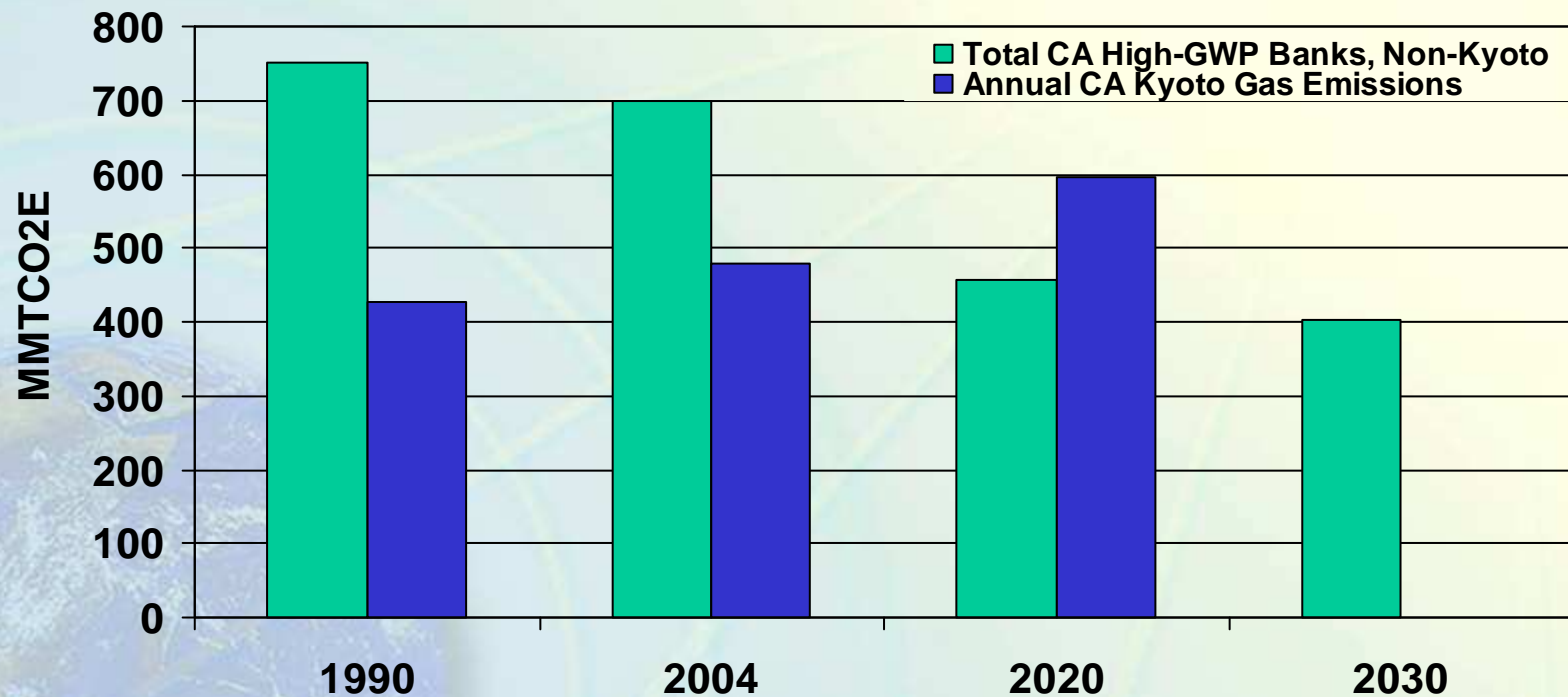
Major CA High-GWP GHG Emissions Sources

- Largest Sources Known From USEPA, IPCC/TEAP

2006 Emissions (MMT CO₂E)



CA High-GWP GHG Banks

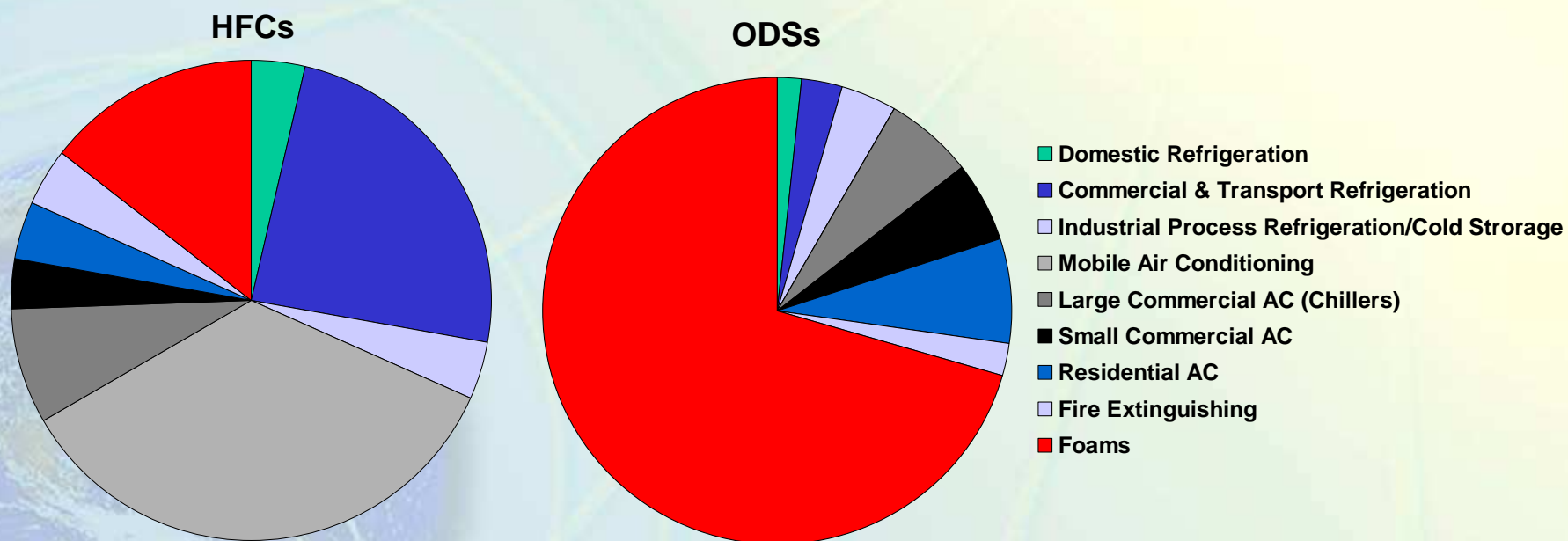


Note: Bank Estimates Exceed Total CO2E Estimates in 2004

Major CA High-GWP GHG Bank Sources

- Largest Sources Known From USEPA, IPCC/TEAP

2006 Banks (MMT CO₂E)



Existing Controls

- Existing Controls
 - HFCs Subject to “No Venting” Only
 - AB 1493 Will Reduce HFC-134a Emissions from MVACs
 - ODSs Have Some Sales, Record-Keeping, Technician/Handler, and Emissions Restrictions
 - Section 608 and 609 of CAAA and SCAQMD Rule 1415
 - ARB Regulates ODP of Consumer Products

Emission Reduction Approaches

- Existing Systems: Emissions and Bank Management
 - Extend Sections 608 – 609 of CAAA and Rule 1415 to All High-GWP GHGs
 - New EOL Rules and Enforcement of Existing Rules
 - Capture/Recycling/Destruction Where Applicable
 - Voluntary or Mandatory ODS Destruction
- Existing and New Systems
 - Deposit and Return
 - Increased Leak Repair and Equipment Turnover, EOL Stewardship

Emission Reduction Approaches

- New Production: High-GWP GHGs and Equipment
 - Improved Containment
 - Lower-GWP Substitutes
 - NIK Technologies/Lower Charge Systems
 - Improved Energy Efficiency (LCCP Considerations)
 - Deposit and Return
 - EOL Stewardship

Board-Approved Related Early Actions

EA ID	SECTOR	STRATEGY NAME	2020 Reduction, MMTCO ₂ E	2020 Cost Estimates, MTCO ₂ E
12	Consumer Products	Reduction of high GWP GHGs used in consumer products	0.25	\$4-\$5/MTCO ₂ E
16	Mobile	Reduction of HFC-134a from DIY MVAC servicing	1	TBD
23	Stationary	SF ₆ reductions from the non-electric sector	0.1	TBD
28	Mobile	Ban of HFC release from MVAC service / dismantling	0.1	TBD
30	Mobile	Add AC leak tightness test and repair to Smog Check	0.45	TBD
32	Stationary	Specifications for commercial refrigeration	4.7	\$10-\$20/MTCO ₂ E
34	Mobile	Requirement of low-GWP GHGs for new MVACs	2.5	TBD
36	Stationary	Reduction of SF ₆ in electricity generation	TBD	TBD
37	Stationary	High GWP refrigerant tracking, reporting, and recovery program	1.25 - 12+	TBD
38	Stationary	Foam recovery/destruction program	0.9 - ?	\$6.5/TCO ₂ E for automated; \$48/MTCO ₂ E for manual
39	Stationary	Alternative suppressants in fire protection systems	0.1	\$40/MTCO ₂ E

Totals

11 - 23+

\$4 - \$48

Activities Underway

- Continuing to Move Forward with Analyses, Working with Stakeholder Groups (2/08 Workshop)
- Research Projects Underway
 - MVAC Indirect, Direct, and EOL Emissions Studies
 - Inventory Development
 - All End-Use Categories (non-1493 MVACs, RAC, Foam, Solvent, Propellant, Electrical Transmission, and Fire Extinguishing/Chemical Stockpile Inventories)
 - LCA of High-GWP GHG Destruction

Summary

- High-GWP GHG “Sector” Contains a Diverse Array of Chemicals and End-Use Categories
- Control Strategies Include High-GWP GHG Emission and Bank Management (Especially HFCs and ODSs)
- Good Potential for Cost-Effective Emission Reductions
- Potential to Include as Source of Offsets will be evaluated

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